

SEQUENCE LISTING

<110> Amasino, Richard
Schomburg, Fritz
Michaels, Scott
Sung, Si-Bum

<120> Alteration of Flowering Time in Plants

<130> 960296.96871

<140> 09/513,775
<141> 2000-02-25

<150> 60/121,572
<151> 1999-02-25

<150> 60/123,455
<151> 1999-03-05

<160> 10

<170> PatentIn Ver. 2.1

<210> 1
<211> 797
<212> DNA
<213> Arabidopsis thaliana

<220>
<221> CDS
<222> (1)..(588)

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cga caa gtc acc ttc tcc aaa cgt cgc aac ggt ctc atc gag aaa gct 96
Arg Gln Val Thr Phe Ser Lys Arg Arg Asn Gly Leu Ile Glu Lys Ala
20 25 30

cgt cag ctt tct gtt ctc tgt gac gca tcc gtc gct ctt ctc gtc gtc 144
Arg Gln Leu Ser Val Leu Cys Asp Ala Ser Val Ala Leu Leu Val Val
35 40 45

tcc gcc tcc ggc aag ctc tac agc ttc tcc ggc gat aac ctg gtc 192
Ser Ala Ser Gly Leu Tyr Ser Phe Ser Ser Gly Asp Asn Leu Val

50	55	60	
aag atc ctt gat cga tat ggg aaa cag cat gct gat gat ctt aaa gcc 240			
Lys Ile Leu Asp Arg Tyr Gly Lys Gln His Ala Asp Asp Leu Lys Ala			
65	70	75	80
ttg gat cat cag tca aaa gct ctg aac tat ggt tca cac tat gag cta 288			
Leu Asp His Gln Ser Lys Ala Leu Asn Tyr Gly Ser His Tyr Glu Leu			
85	90	95	
ctt gaa ctt gtg gat agc aag ctt gtg gga tca aat gtc aaa aat gtg 336			
Leu Glu Leu Val Asp Ser Lys Leu Val Gly Ser Asn Val Lys Asn Val			
100	105	110	
agt atc gat gct ctt gtt caa ctg gag gaa cac ctt gag act gcc ctc 384			
Ser Ile Asp Ala Leu Val Gln Leu Glu Glu His Leu Glu Thr Ala Leu			
115	120	125	
tcc gtg act aga gcc aag aag acc gaa ctc atg ttg aag ctt gtt gag 432			
Ser Val Thr Arg Ala Lys Lys Thr Glu Leu Met Leu Lys Leu Val Glu			
130	135	140	
aat ctt aaa gaa aag gag aaa atg ctg aaa gaa gag aac cag gtt ttg 480			
Asn Leu Lys Glu Lys Glu Lys Met Leu Lys Glu Glu Asn Gln Val Leu			
145	150	155	160
gct agc cag atg gag aat aat cat cat gtg gga gca gaa gct gag atg 528			
Ala Ser Gln Met Glu Asn Asn His His Val Gly Ala Glu Ala Glu Met			
165	170	175	
gag atg tca cct gct gga caa atc tcc gac aat ctt ccg gtg act ctc 576			
Glu Met Ser Pro Ala Gly Gln Ile Ser Asp Asn Leu Pro Val Thr Leu			
180	185	190	
cca cta ctt aat tagccacctt aaatcgccgg ttgaaatcaa aatccaaaac 628			
Pro Leu Leu Asn			
195			
atataataatt atgaagaaaa aaaaaataag atatgttaatt attccgctga taagggcgag 688			
cgtttgtata tcttaataact ctctctttgg ccaagagact ttgtgtgtga tacttaagta 748			
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<210> 2
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 <212> PRT

<213> *Arabidopsis thaliana*

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Met Gly Arg Lys Lys Leu Glu Ile Lys Arg Ile Glu Asn Lys Ser Ser
1 5 10 15

Arg Gln Val Thr Phe Ser Lys Arg Arg Asn Gly Leu Ile Glu Lys Ala
20 25 30

Arg Gln Leu Ser Val Leu Cys Asp Ala Ser Val Ala Leu Leu Val Val
35 40 45

Ser Ala Ser Gly Lys Leu Tyr Ser Phe Ser Ser Gly Asp Asn Leu Val
50 55 60

Lys Ile Leu Asp Arg Tyr Gly Lys Gln His Ala Asp Asp Leu Lys Ala
65 70 75 80

Leu Asp His Gln Ser Lys Ala Leu Asn Tyr Gly Ser His Tyr Glu Leu
85 90 95

Leu Glu Leu Val Asp Ser Lys Leu Val Gly Ser Asn Val Lys Asn Val
100 105 110

Ser Ile Asp Ala Leu Val Gln Leu Glu Glu His Leu Glu Thr Ala Leu
115 120 125

Ser Val Thr Arg Ala Lys Lys Thr Glu Leu Met Leu Lys Leu Val Glu
130 135 140

Asn Leu Lys Glu Lys Glu Lys Met Leu Lys Glu Glu Asn Gln Val Leu
145 150 155 160

Ala Ser Gln Met Glu Asn Asn His His Val Gly Ala Glu Ala Glu Met
165 170 175

Glu Met Ser Pro Ala Gly Gln Ile Ser Asp Asn Leu Pro Val Thr Leu
180 185 190

Pro Leu Leu Asn
195

<210> 3

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<212> DNA

<213> *Arabidopsis thaliana*

<220>

<221> CDS

<222> (1)..(519)

<400> 3

atg gga aga aga aaa atc gag atc aag cga atc gag aac aaa agc agt 48
Met Gly Arg Arg Lys Ile Glu Ile Lys Arg Ile Glu Asn Lys Ser Ser
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cga caa gtc act ttc tcc aaa cga cgc aat ggt ctc atc gac aaa gct 96
Arg Gln Val Thr Phe Ser Lys Arg Arg Asn Gly Leu Ile Asp Lys Ala
20 25 30

cga caa ctt tcg att ctc tgt gaa tcc tcc gtc gct gtt gtc gtc gta 144
Arg Gln Leu Ser Ile Leu Cys Glu Ser Ser Val Ala Val Val Val
35 40 45

tct gcc tcc gga aaa ctc tat gac tct tcc ggt gac gac att tcc 192
Ser Ala Ser Gly Lys Leu Tyr Asp Ser Ser Gly Asp Asp Ile Ser
50 55 60

aag atc att gat cgt tat gaa ata caa cat gct gat gaa ctt aga gcc 240
Lys Ile Ile Asp Arg Tyr Glu Ile Gln His Ala Asp Glu Leu Arg Ala
65 70 75 80

tta gat ctt gaa gaa aaa att cag aat tat ctt cca cac aag gag tta 288
Leu Asp Leu Glu Glu Lys Ile Gln Asn Tyr Leu Pro His Lys Glu Leu
85 90 95

cta gaa aca gtc caa agc aag ctt gaa gaa cca aat gtc gat aat gta 336
Leu Glu Thr Val Gln Ser Lys Leu Glu Glu Pro Asn Val Asp Asn Val
100 105 110

agt gta gat tct cta att tct ctg gag gaa caa ctt gag act gct ctg 384
Ser Val Asp Ser Leu Ile Ser Leu Glu Glu Gln Leu Glu Thr Ala Leu
115 120 125

tcc gta agt aga gct agg aag gca gaa ctg atg atg gag tat atc gag 432
Ser Val Ser Arg Ala Arg Lys Ala Glu Leu Met Met Glu Tyr Ile Glu
130 135 140

tcc ctt aaa gaa aag gag aaa ttg ctg aga gaa gag aac cag gtt ctg 480
Ser Leu Lys Glu Lys Glu Lys Leu Leu Arg Glu Glu Asn Gln Val Leu
145 150 155 160

gct agc cag ctg tca gag aag aaa ggt atg tct cac cga tgaaagatac 529
Ala Ser Gln Leu Ser Glu Lys Lys Gly Met Ser His Arg

165

170

tcaaaaacccg atggaaaga atacgttgct ggcaacagat gatgagagag gaatgttcc 589
 gggaaatgc tccggcaaca aaataccgga gactctcccg ctgctcaatt agccaccatc 649
 atcaacggct gagtttcac cttaaactca aagcctgatt cataattaag agaataaatt 709
 tgtatattat aaaaagctgt gtaatctcaa acctttatc ttccctctagt gtgaaattta 769
 aggtcaaaaa gaaaacgaga aagtatggat cagtgttgta ctccttcgg agacaagatc 829
 agagtttgta tgtttgta tgaatgtacg gattggattt ttaaagttgt gcttttttc 889
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<210> 4

<211> 173

<212> PRT

<213> *Arabidopsis thaliana*

<400> 4

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															30
20															

Arg	Gln	Leu	Ser	Ile	Leu	Cys	Glu	Ser	Ser	Val	Ala	Val	Val	Val	
35															45

Ser	Ala	Ser	Gly	Lys	Leu	Tyr	Asp	Ser	Ser	Gly	Asp	Asp	Ile	Ser	
50															60

Lys	Ile	Ile	Asp	Arg	Tyr	Glu	Ile	Gln	His	Ala	Asp	Glu	Leu	Arg	Ala
65															80

Leu	Asp	Leu	Glu	Glu	Lys	Ile	Gln	Asn	Tyr	Leu	Pro	His	Lys	Glu	Leu
85															95

Leu	Glu	Thr	Val	Gln	Ser	Lys	Leu	Glu	Glu	Pro	Asn	Val	Asp	Asn	Val
100															110

Ser	Val	Asp	Ser	Leu	Ile	Ser	Leu	Glu	Glu	Gln	Leu	Glu	Thr	Ala	Leu
115															125

Ser Val Ser Arg Ala Arg Lys Ala Glu Leu Met Met Glu Tyr Ile Glu

130

135

140

Ser Leu Lys Glu Lys Glu Lys Leu Leu Arg Glu Glu Asn Gln Val Leu
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<212> DNA

<213> *Arabidopsis thaliana*

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<221> CDS

<222> (1)..(534)

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 1 5 10 15

cga caa gtc act ttc tcc aaa cga cgc aat ggt ctc atc gag aaa gct 96
 Arg Gln Val Thr Phe Ser Lys Arg Arg Asn Gly Leu Ile Glu Lys Ala
 20 25 30

cga caa ctt tca att ctc tgt gaa tct tcc atc gct gtt ctc gtc gtc 144
 Arg Gln Leu Ser Ile Leu Cys Glu Ser Ser Ile Ala Val Leu Val Val
 35 40 45

tcc ggc tcc gga aaa ctc tac aag tct gcc tcc ggt gac aac atg tca 192
 Ser Gly Ser Gly Lys Leu Tyr Lys Ser Ala Ser Gly Asp Asn Met Ser
 50 55 60

aag atc att gat cgt tac gaa ata cat cat gct gat gaa ctt gaa gcc 240
 Lys Ile Ile Asp Arg Tyr Glu Ile His His Ala Asp Glu Leu Glu Ala
 65 70 75 80

tta gat ctt gca gaa aaa act cgg aat tat ctg cca ctc aaa gag tta 288
 Leu Asp Leu Ala Glu Lys Thr Arg Asn Tyr Leu Pro Leu Lys Glu Leu
 85 90 95

cta gaa ata gtc caa agc aag ctt gaa gaa tca aat gtc gat aat gca 336
 Leu Glu Ile Val Gln Ser Lys Leu Glu Glu Ser Asn Val Asp Asn Ala
 100 105 110

agt gtg gat act tta att tct ctg gag gaa cag ctc gag act gct ctg 384
Ser Val Asp Thr Leu Ile Ser Leu Glu Glu Gln Leu Glu Thr Ala Leu
115 120 125

tcc gta act aga gct agg aag aca gaa cta atg atg ggg gaa gtg aag 432
Ser Val Thr Arg Ala Arg Lys Thr Glu Leu Met Met Gly Glu Val Lys
130 135 140

tcc ctt caa aaa acg gag aac ttg ctg aga gaa gag aac cag act ttg 480
Ser Leu Gln Lys Thr Glu Asn Leu Leu Arg Glu Glu Asn Gln Thr Leu
145 150 155 160

gct agc cag gtg aca aaa aca tct ctt gaa gct aat tca tca gtt gat 528
Ala Ser Gln Val Thr Lys Thr Ser Leu Glu Ala Asn Ser Ser Val Asp
165 170 175

aca caa taaaaataga aattacactt gcgttaaaca tatatatata aaagttgaag 584
Thr Gln

gactttgatt gatgttaggc attttttttg taaaacccccc atatatctta aaatctatga 644

taaaagtccct ttcaaaattc aaatttcttg ttactattta gttgaatgat cagtttaat 704

taatgaaaatt ttcccaaaaaa aaaaaaaaaa aaaaaaaaaa aaaaaaaaaa aaaaaaaaaa 764

aaaaaa 769

<210> 6

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<212> PRT

<213> *Arabidopsis thaliana*

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Arg Gln Val Thr Phe Ser Lys Arg Arg Asn Gly Leu Ile Glu Lys Ala
20 25 30

Arg Gln Leu Ser Ile Leu Cys Glu Ser Ser Ile Ala Val Leu Val Val
35 40 45

Ser Gly Ser Gly Lys Leu Tyr Lys Ser Ala Ser Gly Asp Asn Met Ser
50 55 60

Lys Ile Ile Asp Arg Tyr Glu Ile His His Ala Asp Glu Leu Glu Ala
65 70 75 80

Leu Asp Leu Ala Glu Lys Thr Arg Asn Tyr Leu Pro Leu Lys Glu Leu
85 90 95

Leu Glu Ile Val Gln Ser Lys Leu Glu Glu Ser Asn Val Asp Asn Ala
100 105 110

Ser Val Asp Thr Leu Ile Ser Leu Glu Glu Gln Leu Glu Thr Ala Leu
115 120 125

Ser Val Thr Arg Ala Arg Lys Thr Glu Leu Met Met Gly Glu Val Lys
130 135 140

Ser Leu Gln Lys Thr Glu Asn Leu Leu Arg Glu Glu Asn Gln Thr Leu
145 150 155 160

Ala Ser Gln Val Thr Lys Thr Ser Leu Glu Ala Asn Ser Ser Val Asp
165 170 175

Thr Gln

<210> 7

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<212> DNA

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<222> (1)..(588)

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<221> unsure

<222> (839)

<223> unsure

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aga caa gtc acc tcc tgc aaa cga cgc aac ggt ctc atc gag aaa gct 96
Arg Gln Val Thr Ser Cys Lys Arg Arg Asn Gly Leu Ile Glu Lys Ala
20 25 30

cgt cag ctt tct gtt ctc tgc gag gca tct gtt ggg ctt ctc gtt gtc 144

Arg Gln Leu Ser Val Leu Cys Glu Ala Ser Val Gly Leu Leu Val Val
 35 40 45
 tcc gcc tcc gac aaa ctc tac agc ttc tcc tcc ggg gat aga ctg gag 192
 Ser Ala Ser Asp Lys Leu Tyr Ser Phe Ser Ser Gly Asp Arg Leu Glu
 50 55 60
 aag atc ctt gat cga tat ggg aaa aaa cat gct gat gat ctc aat gcc 240
 Lys Ile Leu Asp Arg Tyr Gly Lys Lys His Ala Asp Asp Leu Asn Ala
 65 70 75 80
 ctg gat ctt cag tca aaa tct ctg aac tat agt tca cac cat gag cta 288
 Leu Asp Leu Gln Ser Lys Ser Ileu Asn Tyr Ser Ser His His Glu Leu
 85 90 95
 cta gaa ctt gtg gaa aag ctt gtg gaa tca att gat gat gta agc 336
 Leu Glu Leu Val Glu Ser Lys Leu Val Glu Ser Ile Asp Asp Val Ser
 100 105 110
 gtg gat tcc ctc gtt gag cta gaa gat cac ctt gag act gcc ctc tct 384
 Val Asp Ser Leu Val Glu Leu Glu Asp His Leu Glu Thr Ala Leu Ser
 115 120 125
 gta act aga gct cgg aag gca gaa cta atg tta aag ctt gtt gaa agt 432
 Val Thr Arg Ala Arg Lys Ala Glu Leu Met Leu Lys Leu Val Glu Ser
 130 135 140
 ctc aaa gaa aag gag aat ctg ctg aaa gaa gag aac cag gtt ttg gct 480
 Leu Lys Glu Lys Glu Asn Leu Leu Lys Glu Glu Asn Gln Val Leu Ala
 145 150 155 160
 agt cag att gag gag aaa aat ctt gag gga gcc gaa gct gat aat ata 528
 Ser Gln Ile Glu Glu Lys Asn Leu Glu Gly Ala Glu Ala Asp Asn Ile
 165 170 175
 gag atg tca tct gga caa atc tcc gac atc aat ctt cct gta act ctc 576
 Glu Met Ser Ser Gly Gln Ile Ser Asp Ile Asn Leu Pro Val Thr Leu
 180 185 190
 ccg ctg ctt aat taaccacctt tactcggcgg ttaatcaaaa taagaaacat 628
 Pro Leu Leu Asn
 195
 ataatctaaa gataacctat gtaggttta ctttcgcag cttatcaac caccttact 688
 cggcggttaa tcgaaattaa aaacatataa ttaacaaata acctatgtca gtttaacccc 748
 ctgataaaaga tgcacgttgt gcatcttagt tctctctctg gctgaggggc tttgtataaa 808

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<212> PRT

<213> Brassica rapa

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20 25 30

Arg Gln Leu Ser Val Leu Cys Glu Ala Ser Val Gly Leu Leu Val Val
35 40 45

Ser Ala Ser Asp Lys Leu Tyr Ser Phe Ser Ser Gly Asp Arg Leu Glu
50 55 60

Lys Ile Leu Asp Arg Tyr Gly Lys Lys His Ala Asp Asp Leu Asn Ala
65 70 75 80

Leu Asp Leu Gln Ser Lys Ser Leu Asn Tyr Ser Ser His His Glu Leu
85 90 95

Leu Glu Leu Val Glu Ser Lys Leu Val Glu Ser Ile Asp Asp Val Ser
100 105 110

Val Asp Ser Leu Val Glu Leu Glu Asp His Leu Glu Thr Ala Leu Ser
115 120 125

Val Thr Arg Ala Arg Lys Ala Glu Leu Met Leu Lys Leu Val Glu Ser
130 135 140

Leu Lys Glu Lys Glu Asn Leu Leu Lys Glu Glu Asn Gln Val Leu Ala
145 150 155 160

Ser Gln Ile Glu Glu Lys Asn Leu Glu Gly Ala Glu Ala Asp Asn Ile
165 170 175

Glu Met Ser Ser Gly Gln Ile Ser Asp Ile Asn Leu Pro Val Thr Leu
180 185 190

Pro Leu Leu Asn

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<210> 9
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 <222> (1)..(588)

<400> 9
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 Met Gly Arg Lys Lys Leu Glu Ile Lys Arg Ile Glu Asn Lys Ser Ser
 1 5 10 15

cga caa gtc acc ttc tcc aaa cga cgc agc ggt ctc atc gag aaa gct 96
 Arg Gln Val Thr Phe Ser Lys Arg Arg Ser Gly Leu Ile Glu Lys Ala
 20 25 30

cgt cag ctt tct gtt ctc tgc gag gca tct gtt ggg ctt ctc gtt gtc 144
 Arg Gln Leu Ser Val Leu Cys Glu Ala Ser Val Gly Leu Leu Val Val
 35 40 45

tcc gcc tcc gac aaa ctc tac agc ttc tcc tcc ggg gat aga ctg gag 192
 Ser Ala Ser Asp Lys Leu Tyr Ser Ser Gly Asp Arg Leu Glu
 50 55 60

aag atc ctt gat cga tat ggg aaa aaa cat gct gat gat ctc aat gcc 240
 Lys Ile Leu Asp Arg Tyr Gly Lys Lys His Ala Asp Asp Leu Asn Ala
 65 70 75 80

ctg gat ctt cag tca aaa tct ctg aac tat agt tca cac cat gag cta 288
 Leu Asp Leu Gln Ser Lys Ser Leu Asn Tyr Ser Ser His His Glu Leu
 85 90 95

cta gaa ctt gtg gaa agc aag ctt gtg gaa tca att gat gat gta agc 336
 Leu Glu Leu Val Glu Ser Lys Leu Val Glu Ser Ile Asp Asp Val Ser
 100 105 110

gtg gat tcc ctc gtt gag cta gaa gat cac ctt gag act gcc ctc tct 384
 Val Asp Ser Leu Val Glu Leu Glu Asp His Leu Glu Thr Ala Leu Ser
 115 120 125

gta act aga gct cgg aag gca gaa cta atg tta aag ctt gtt gaa agt 432
 Val Thr Arg Ala Arg Lys Ala Glu Leu Met Leu Lys Leu Val Glu Ser
 130 135 140

ctc aaa gaa aag gag aat ctg ctg aaa gaa gag aac cag gtt ttg gct 480
Leu Lys Glu Lys Glu Asn Leu Leu Lys Glu Glu Asn Gln Val Leu Ala
145 150 155 160

agt cag att gag aag aaa aat ctt gag gga gcc gaa gct gat aat ata 528
Ser Gln Ile Glu Lys Lys Asn Leu Glu Gly Ala Glu Ala Asp Asn Ile
165 170 175

gag atg tca tct gga caa atc tcc gac atc aat ctt cct gta act ctc 576
Glu Met Ser Ser Gly Gln Ile Ser Asp Ile Asn Leu Pro Val Thr Leu
180 185 190

ccg ctg ctt aat taaccacctt tactcggcgg ttaatcaaaa taagaaacat 628
Pro Leu Leu Asn
195

ataatctaaa gataacctat gtaggttta cttttcgca gtttacaccc 688

cggcggttaa tcgaaattaa aaacatataa ttaacaaata acctatgtca gtttacccc 748

ctgataaaga tgcacgttgt acatcttagt tctctctctg gctgagggc tgtgtataa 808

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<210> 10

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<212> PRT

<213> Brassica rapa

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Met Gly Arg Lys Lys Leu Glu Ile Lys Arg Ile Glu Asn Lys Ser Ser
1 5 10 15

Arg Gln Val Thr Phe Ser Lys Arg Arg Ser Gly Leu Ile Glu Lys Ala
20 25 30

Arg Gln Leu Ser Val Leu Cys Glu Ala Ser Val Gly Leu Leu Val Val
35 40 45

Ser Ala Ser Asp Lys Leu Tyr Ser Phe Ser Ser Gly Asp Arg Leu Glu
50 55 60

Lys Ile Leu Asp Arg Tyr Gly Lys Lys His Ala Asp Asp Leu Asn Ala
65 70 75 80

Leu Asp Leu Gln Ser Lys Ser Leu Asn Tyr Ser Ser His His Glu Leu

85

90

95

Leu Glu Leu Val Glu Ser Lys Leu Val Glu Ser Ile Asp Asp Val Ser
100 105 110

Val Asp Ser Leu Val Glu Leu Glu Asp His Leu Glu Thr Ala Leu Ser
115 120 125

Val Thr Arg Ala Arg Lys Ala Glu Leu Met Leu Lys Leu Val Glu Ser
130 135 140

Leu Lys Glu Lys Glu Asn Leu Leu Lys Glu Glu Asn Gln Val Leu Ala
145 150 155 160

Ser Gln Ile Glu Lys Lys Asn Leu Glu Gly Ala Glu Ala Asp Asn Ile
165 170 175

Glu Met Ser Ser Gly Gln Ile Ser Asp Ile Asn Leu Pro Val Thr Leu
180 185 190

Pro Leu Leu Asn
195